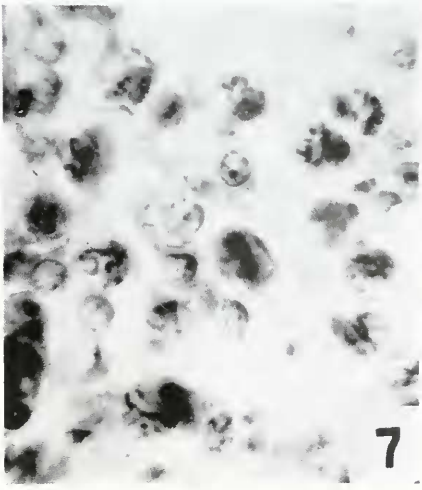
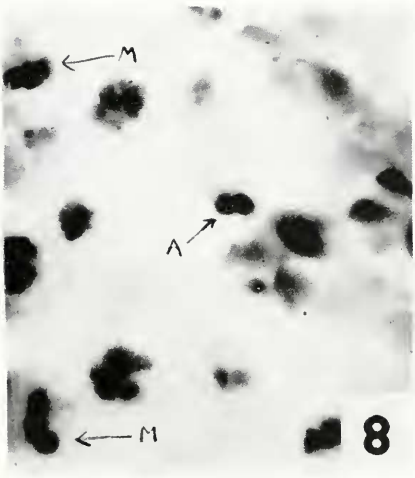
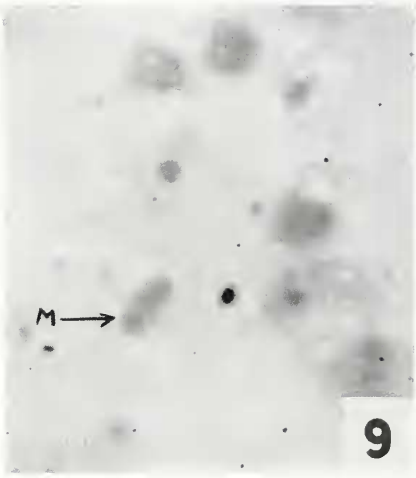
PLATE II







Photomicrographs from 5 micra thick sections. Figures 6–8 show alkaline phosphatase activity with sodium glycerophosphate as substrate.

FIGURE 6. Small intestine of mouse showing activity of the enzyme distributed in the mucosa and submucosa layers. Magnification is 1000 ×.

FIGURE 7. Testis of mouse. Magnification is 1000 ×.

FIGURE 8. Testis of mouse. *M* indicates chromosomes in metaphase. *A* indicates chromosomes in anaphase. Magnification is 1000 ×.

FIGURE 9. Testis of mouse from a control slide with no substrate for enzyme activity applied. *M* indicates chromosomes in metaphase. Magnification is 1000 ×.

types, as follows: first, a general alkaline phosphatase reaction in both the cytoplasm and the nucleus, as in the case where sodium glycerophosphate and nucleotides are used as substrates; second, a definite nuclear reaction with little or no activity in the cytoplasm, as in the case of depolymerized desoxyribose nucleic acid as substrate; third, a definite cytoplasmic reaction with little reaction in the nucleus, as in the case of ribose nucleic acid as substrate. Since the enzymes cannot be isolated at this time, and since the nuclear and the cytoplasmic reactions are not absolutely specifically nuclear or cytoplasmic, they will be listed as reaction types with reference only to the location of the activity observed. With the different substrates used, the total reaction of phosphatase activity is somehow produced, and this is detected by the location of the cobaltous sulfide precipitate. The final reactions produced under a

TABLE II

Intensity of precipitate of phosphatase reaction in different tissues using different substrates with and without arsenate ions

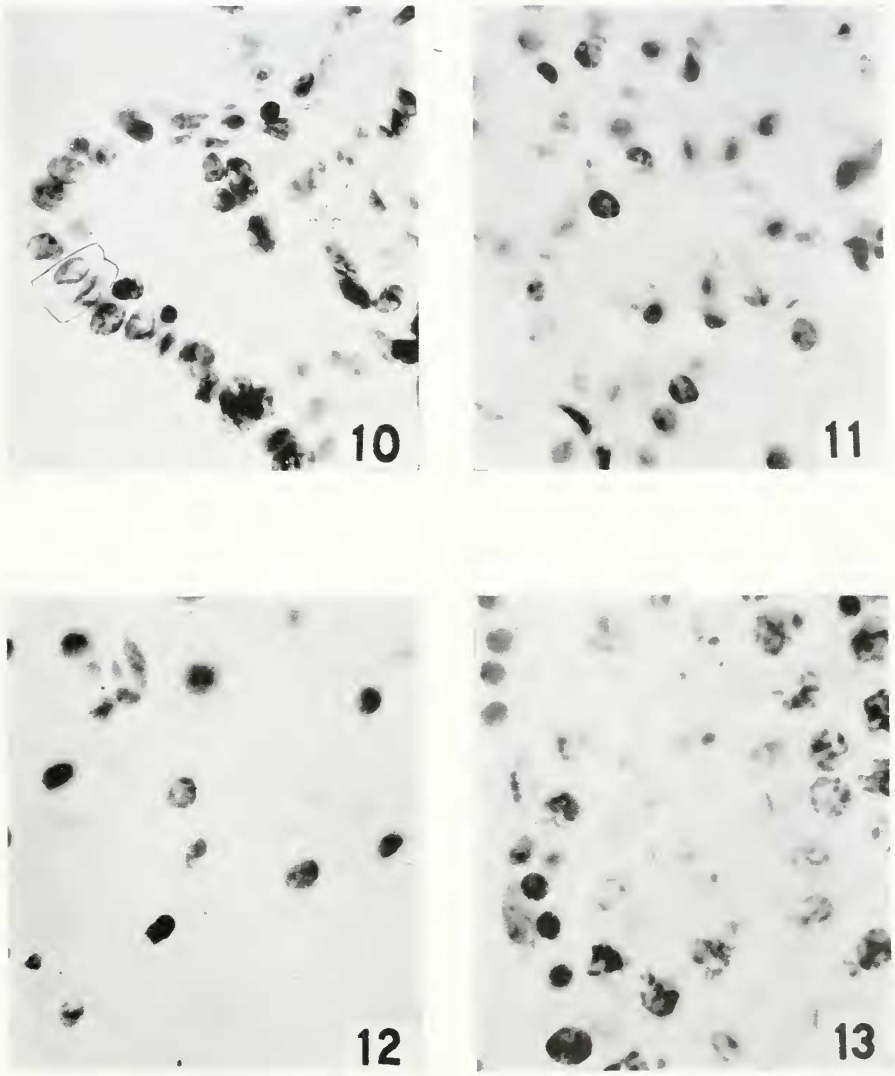
Substrate	Intestine		Testes		Liver		Pancreas		Kidney	
	c	n	c	n	c	n	c	n	c	n
Sodium glycerophosphate										
No arsenate ions	1	2	1	2	0	2	±1	2	3	2
With arsenate ions	1	1*S1	1	2	0	0*S3	±1	2*S0	2	±1*S1
Depolymerized desoxyribose n. acid										
No arsenate ions	0	2	0	2	0	2	0	2	1	2
With arsenate ions	0	0*S3	0	0*S3	0	0*S3	0	±1*S2	0	0*S3
Ribose nucleic acid										
No arsenate ions	2	±1	2	1	1	±1	2	±1	2	1
With arsenate ions	0	0*S3	2	0*S3	0	0*S3	0	0*S3	2	1*S0

*S = suppression estimates.
S0 is no suppression.
S1 is slight suppression.
S2 is much suppression.
S3 is complete suppression.
Each record represents observation on 8 experimental slides.

variety of substrate conditions must be due to at least three different enzymes, working in at least two different complexes.

The suggestion that the reactions observed are due to complexes of enzymes is based on the chemical structure of nucleic acids. The ribose and desoxyribose nucleic acids, which were applied as substrates, are polymers of mononucleotides, which are considered to be linked to each other by an ester bond between the phosphate group of one nucleotide and the sugar group of the neighboring nucleotide, thus making the nucleic acids diesters of phosphoric acid all along the chain except in the terminal monoester of phosphoric acid. The total phosphatase action on the nucleic acids might be considered as essentially due to a specific desoxyribose nucleic acid phosphodiesterase, and a specific ribose nucleic acid phosphodiesterase action liberating mononucleotides of the nucleic acids, which then are hydrolyzed by a phospho-

PLATE III



Photomicrographs from 5 micra sections. Figures 10–13 show alkaline phosphatase activity with depolymerized desoxyribose nucleic acid as substrate.

FIGURE 10. Small intestine of mouse showing the distribution of the enzyme activity in the mucosa layer. Magnification is 1000 ×.

FIGURE 11. Kidney of mouse showing enzyme activity in the proximal tubules seen in cross-section. Magnification is 1000 ×.

FIGURE 12. Pancreas of mouse showing distribution of enzyme activity. Magnification is 1000 ×.

FIGURE 13. Testis of mouse showing enzyme activity. Magnification is 1000 ×.

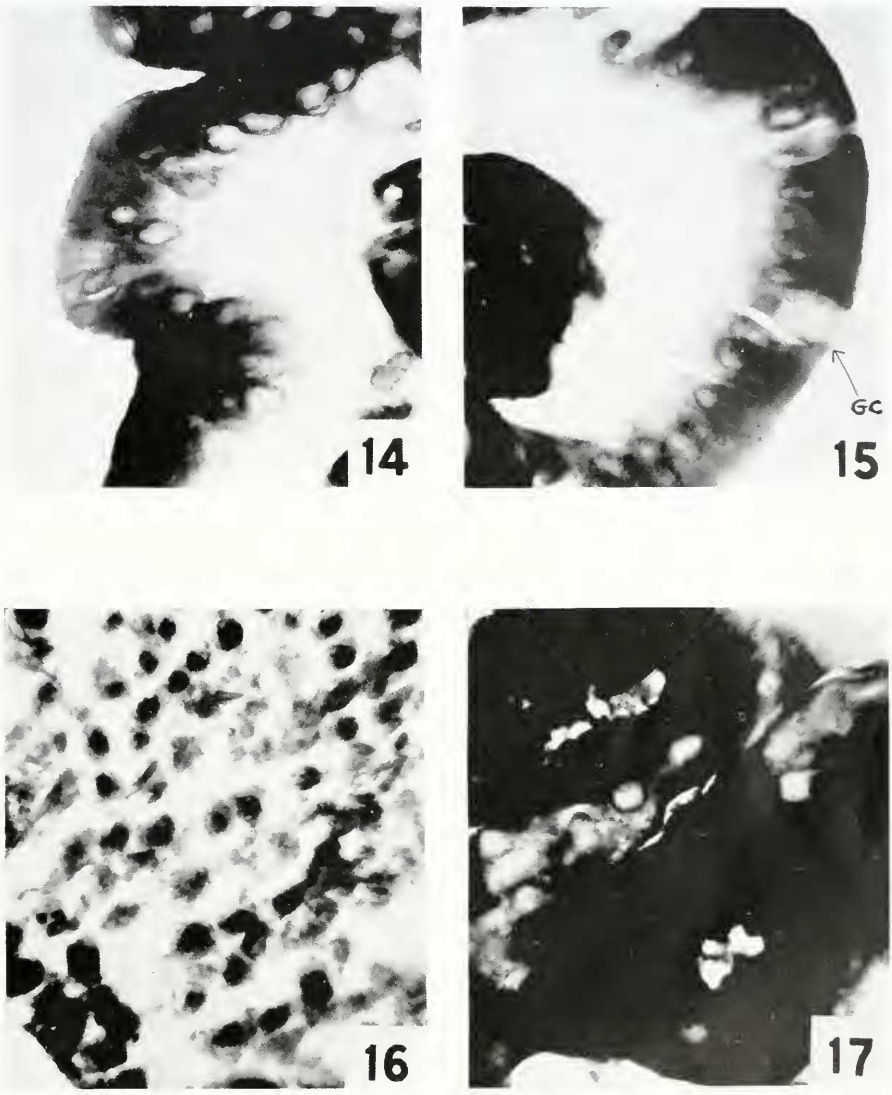
monoesterase to liberate the inorganic phosphate. Thus the precipitate formed when the nucleic acids are applied as substrates is due to the activity of at least two different enzyme complexes, as follows: in the *cytoplasm*, first, a specific phosphodiesterase ("plasmonucleodiesterase") liberates ribonucleotides; second, phosphomonoesterase liberates inorganic phosphates from these nucleotides; in the *nucleus*, first, a specific phosphodiesterase[3] ("chromonucleodiesterase") liberates desoxyribosenucleotides; second, phosphomonesterase liberates inorganic phosphate from these nucleotides. This specificity of the diesterase follows from the fact that ribose nucleic acid will not serve as substrate for the nuclear diesterase activity, nor will desoxyribose nucleic acid serve for the cytoplasmic activity. With regard to the monoesterase activity, however, no such specificity has been detected, for the products of ribose nucleic acid hydrolysis serve equally well as substrates for phosphate production in either nucleus or cytoplasm.

While the action of the phosphodiesterase in freeing mononucleotides from lower polynucleotides (depolymerized nucleic acid) presumably can only occur by attack upon the linkage between the phosphate of one nucleotide and the sugar of the adjacent unit, it is evident that there is considerable restriction upon the exact nature of the bond which can be so attacked. If the enzyme were able to hydrolyze the bond at many points along a nucleic acid chain (consisting, let us say, of 2000 nucleotides) the diesterase should also function as a depolymerase, and a phosphate precipitate should be formed when the long, polynucleotide chains (polymerized nucleic acid) are used as substrate. Even after 72 hours action, however, there is no visible precipitate under these conditions, in contrast to the depolymerized nucleic acid experiments in which a dense precipitate is formed in a few hours. The type of bond which the diesterase can attack is evidently one which is enormously multiplied by a process of depolymerization. A most obvious view of enzyme specificity that would agree well with these facts is that the diesterase can attack only the bond between a terminal nucleotide and the penultimate nucleotide. Considering, for example, an extreme case, depolymerization of a 2000 unit polynucleotide chain to the minimum tetranucleotide should increase the number of bonds which such a specific diesterase can attack by a factor of 500. If specific terminal hydrolysis is the mechanism, the amount of mononucleotide that would become available by diesterase action upon the end of a highly polymerized nucleic acid chain would surely give an amount of phosphate precipitate so slight that it would be cytologically undetectable.

It is highly important to the question of the functional significance of the distribution of the phosphatases acting on the nucleic acids, that this actually coincides in a striking manner with the known locations of desoxyribose and ribose nucleic acids within the cell. The phosphatase activity on depolymerized desoxyribose nucleic acid is restricted to the chromatin of the nucleus, the only part of the cell in which this type of nucleic acid is found. By contrast, the ribose nucleic acid phosphatase activity is in the cytoplasm, a region in which only ribose nucleic acid has ever been demonstrated. (The only marked discrepancy is the occurrence of desoxyribose

[3] Concerning the existence of this nuclear diesterase, there is some possible supporting evidence from the work by Mazia and Ballentine, reported by Mazia (1941), on an intranuclear enzyme from Arbacia eggs. Their enzyme, termed polynucleotidase, was active at a pH 9.0 and was capable of reacting on desoxyribose nucleic acid still in a polymerized form.

PLATE IV



Photomicrographs from 5 micra thick sections. Figures 14–17 show alkaline phosphatase activity with ribose nucleic acid as the substrate.

FIGURE 14. Small intestine of mouse showing the enzyme activity in the cells of the mucosa layer. Magnification is 1000 ×.

FIGURE 15. Small intestine of mouse showing goblet cells in the mucosa layer and the distribution of the enzyme activity. Magnification is 1000 ×.

FIGURE 16. Testis of mouse showing the enzyme activity. A denser precipitate is found in the nuclei of testis cells than in nuclei of other tissues under the conditions of the same substrate. Magnification is 1000 ×.

FIGURE 17. Kidney of mouse, showing enzyme activity in the proximal tubules in cross-section. Magnification is 1000 ×.

nucleic acid phosphatase activity in the nucleolus, which, since it is Feulgen negative, is considered to contain ribose nucleic acid.) [4]

Certain possible *in vivo* functions of these alkaline phosphatases are at once obvious. Not only can the nuclear diesterase split off terminal mononucleotides, as in these experiments, but in the reverse direction, it may conceivably catalyze the terminal growth in the development of nucleotide chains. One may easily picture the later stages of synthesis of a full length nucleic acid chain as involving the cooperation of two enzymes: the diesterase slowly builds up short chains by terminal growth and this is followed by the action of the depolymerase type of enzyme catalyzing the union of these short chains into the long complex which is such an important structural component of a chromosome.

While it is also obvious that catalysis of the synthesis of a mononucleotide from a nucleoside by phosphomonesterase is an essential step in nucleic acid synthesis, one's attention here tends rather to focus on the possibilities of dephosphorylation of nucleotide as a source of energy for nuclear and cytoplasmic reactions. Thus energy for synthesis of chromosomes and their products may or may not be available according to whether the nucleotides are structurally isolated from phosphomonesterase activity by being bound in nucleic acid chains, or whether as a result of a successive action of nuclear depolymerase, and "chromonucleodiesterase," there is mononucleotide available for dephosphorylation. Similarly the actual availability of energy for such cyclic nuclear mechanical processes as chromosome coiling and mitotic movement may be dependent upon a cycle of binding and release of mononucleotide from its nucleic acid storehouse.

Summary

1. Using the histochemical test for alkaline phosphatase reaction in the larval salivary glands of several species of Drosophila, activity was found to be present in three main parts of the cell; the cytoplasm, the nucleolus, and the chromosomes.

2. Phosphatase activity was found rather generally distributed in both the cytoplasm and the nucleus. Within the larval salivary gland chromosomes, the enzyme activity was localized in those chromosomal regions which are Feulgen positive, and thus corresponds to the regions containing large concentrations of desoxyribose nucleic acid.

3. Different naturally occurring phosphate bearing substances were used as phosphatase substrates on mouse tissues, and resulted in demonstration of three different types of phosphatase reactions based on the localization of the enzyme activity.

a) A general reaction with phosphatase activity located in both nucleus (nucleolus and chromosomes) and the cytoplasm was present when sodium glycerophosphate and nucleotides were used as substrates.

b) No phosphatase reaction occurred on polymerized desoxyribose nucleic acid, but a specific nuclear reaction (nucleolus and chromosomes) was present when nuclease-depolymerized desoxyribose nucleic acid was used as a substrate.

[4] We do not actually know the location of the possible substrates for the diesterase activity, since the methods for localizing nucleic acids do not, in all likelihood, preserve any but the high polymers, and it may well be that the lower polymers of the sort used as substrates are not the same in distribution as the larger complexes. In such a difference may lie the explanation of the discrepancies above.

c) A strong cytoplasmic reaction with slight reaction in the nucleus was present when ribose nucleic acid was used as a substrate.

4. Subjection to several environmental variables produced little further evidence as to the differences among these three types of localized reactions.

5. The three types of alkaline phosphatase reactions observed were suggested to be due to at least two phosphodiesterases and a phosphomonesterase.

6. The nuclear phosphatase complex and the cytoplasmic phosphatase complex each probably consist of a specific phosphodiesterase, which splits the ester linkage between the phosphate of one nucleotide and the sugar of the neighboring nucleotide, and a phosphomonesterase which splits the second ester linkage and liberates inorganic phosphate.

Acknowledgment

I wish to express my appreciation and gratitude to Professor H. Burr Steinbach for originally bringing to my attention the cytochemical possibilities of the alkaline phosphatase test; to Professor Arthur W. Pollister for his advice and encouragement throughout the course of the work and for his help in the preparation of the manuscript; to Dr. Alfred E. Mirsky for advice and essential materials; and to Dr. Robert Ballentine and Dr. Jack Schultz for many helpful suggestions.

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side ; a linguiform sharp projection overlapping the lower extremity of the labium.

Height 0·06, greatest breadth 0·076, least breadth 0·063.

Named in compliment to Thomas Bridges, Esq., an able zoological and botanical collector, particularly in Chili and other parts of South America.

LINDSLEYA SALLÉANA, Chitty.

Hab. New Forest, Manchester (unique).

Form, globose-conic. *Colour*, —— ? *Sculpture*, 12 strong spiral carinæ, 2 fine in each interspace and 3 less strong round the umbilicus : on the upper whorls 4 corresponding fine ones. *Spire*, well elevated, with rather concave outlines. *Whorls*, $4\frac{3}{4}$, well rounded, with a deep suture. *Aperture*, slightly expanded above, more so below, scarcely detached from last whorl, more than a semicircle. *Labrum*, scarcely produced from body-whorl, not produced above, very slightly reflexed and thickened, coarsely pectinated by the strong carinæ. *Labium*, moderately detached from body-whorl, slightly curved throughout, on a plane with labrum. *Umbilicus*, broad and moderately deep. *Labral lamella*, much produced at its junction with labrum, below, sharp, and dipping abruptly into the umbilicus. *Operculum*, ——?

Height 0·079, greatest breadth 0·092, least breadth 0·073.

Named in compliment to M. Auguste Sallé, an excellent zoological collector.

LINDSLEYA ARTHURIANA, Chitty.

Hab. John Crow Hill, Portland.

Form, globose-conic. *Colour*, light yellow. *Sculpture*, 31 raised spiral carinæ, not quite equidistant ; on the upper whorls 7. *Spire*, well elevated, with rather convex outlines. *Whorls*, $3\frac{2}{3}$, very well rounded, with a deep suture, last whorl very globose. *Aperture*, slightly and somewhat abruptly expanded, more than a semicircle, subelliptical, slightly depressed above and expanded below. *Labrum*, rounded into labium, more broadly below, very slightly produced above, double, white, smooth, not pectinated. *Labium*, scarcely detached from body-whorl, on a plane with labrum. *Umbilicus*, very shallow, broad. *Labral lamella*, scarcely produced. *Operculum*, slightly concave, very finely granulated in the centre.

Height 0·049, greatest breadth 0·066, least breadth 0·054.

Named in compliment to Arthur Adams, Esq., of London, the conjoint author with his brother Henry Adams.

This shell is like *L. Albersiana*, but differs in sculpture, number of whorls, and measurements.

LINDSLEYA GUTIEREZIANA, Chitty.

Hab. New Hope, Westmoreland.

Form, globose-conic. *Colour*, pale horn. *Sculpture*, 16 strong spiral carinæ, *only* about the periphery one fine intervening ; on the upper whorls, 5. *Spire*, well elevated, with straight outlines. *Whorls*,

5½, well rounded, with a deep suture. *Aperture*, less than a semicircle, very slightly spreading, and very slightly deflected below. *Labrum*, slightly separated from body-whorl, rather produced above, in a broad notch, pectinated by about 15 of the strong carinæ. *Labium*, well detached from body-whorl, curved inwards, more so below; thickened and reflected in the centre and its lower end towards the umbilicus. *Labrum* and *labium* continuous above; *labium* on a plane with labrum below. *Umbilicus*, deep. *Labral lamella*, sharply produced as it leaves the labrum, becoming narrow, and abruptly lost in the umbilicus. *Operculum*, ——?

Height 0·084, greatest breadth 0·15, least breadth 0·082.

Named in compliment to Señor Don Nicolas Josè Gutierez, Curator of the Museum at the Havanna.

Lindsleya Oweniana, Chitty.

Hab. Yallahs Hill.

Form, globose-conic. *Colour*, pale horn. *Sculpture*, 19 strong, rather inequidistant spiral carinæ; on the upper whorls 6. Striæ of growth visible. *Spire*, moderately elevated, with rather concave outlines. *Whorls*, 4½, well rounded, with a deep suture. *Aperture*, semicircular, rather flattened above, slightly expanded in the lower two-thirds. *Labrum*, rather produced above, not reflected, thin, strongly pectinated by spiral carinæ. *Labium*, rather detached from body-whorl, gradually curved to the right below. *Umbilicus*, rather deep and broad, slightly hidden by the *labral lamella*, which is but little produced. *Operculum*, concave, finely granulated, with, on the labral side extending half across, 5 horizontal raised lamellæ converging towards the umbilicus, the margins of which are covered with fine granulations giving the appearance of serration; lower third laps tightly over the labium, grooved horizontally, and then finished by a linguiform, raised, folding projection.

Height 0·069, greatest breadth 0·094, least breadth 0·073.

Named in compliment to Professor Owen.

Lindsleya Wollastoniana, Chitty.

Hab. ——? Hanover.

Form, globose-discoidal. *Colour*, white, semitransparent. *Sculpture*, about 31 very fine inequidistant, irregular, spiral, raised carinæ, about 8 rather stronger than the rest; on the upper whorls 8. *Spire*, slightly raised, with convex outlines. *Whorls*, 3¾, very moderately rounded, with a light suture. *Aperture*, slightly constricted behind labrum, and then slightly expanded, semicircular. *Labrum*, very little produced above, thickened and reflected and very slightly pectinated by the stronger carinæ. *Labium*, well detached from the body-whorl, moderately curved below, on a plane with the labrum. *Umbilicus*, moderately deep and wide. *Labral lamella*, narrow and sharp. *Operculum*, slightly concave, plain and smooth, except a few coarse granulations.

Height 0·036, greatest breadth 0·064, least breadth 0·05.

Named in compliment to T. Vernon Wollaston, Esq., M.A., so well known for his natural-history researches in Madeira.

Genus VIII. Blandia, Chitty.

Shell subdiscoidal, not prominently sculptured.

Blandia Blandiana, Chitty.

See *Stoastoma Blandianum*, Ad. Mon. Stoast. Adams, 1849, p. 6; Cat. Phan. p. 234.

Hab. Peace River, Manchester.

Blandia Jeffreysiana, Chitty.

Hab. Roaring River, Westmoreland.

Form, subdiscoidal. *Colour*, pale yellow. *Sculpture*, 22 fine, distant and nearly equidistant spiral carinæ, 5 interspersed being rather stronger; carinæ finer behind the aperture: on the upper whorls 6. *Spire*, very little elevated, with convex outlines. *Whorls*, $3\frac{1}{2}$, moderately rounded, with a slight suture. *Aperture*, constricted at a distance behind labrum, and widely expanded and cupping inwards at the labium, rather flattened above. *Labrum*, moderately produced above, treble in the upper part, broadly but not deeply scolloped, and pectinated by the 5 stronger carinæ, much thickened, white and shining. *Labium*, thickened and much reflected to the left at its edge, curved to the right below, widely detached from body-whorl, much below the plane of labrum. *Umbilicus*, very deep and broad. *Labral lamella*, rather strong. *Operculum*, very concave, margined with a broad convexly raised ridge something like *Wilkinsonæa Schomburgkiana*, with two deep, plainly-visible, indented grooves on the labial side; 5 sharp diagonal raised lines crossing from right above to left below on the labral side of the hollow.

Height 0·04, greatest breadth 0·063, least breadth 0·047.

Named in compliment to J. Gwyn Jeffreys, Esq., late of Swansea, now of London, a zealous conchologist and possessor of the finest British collection.

Blandia Bairdiana, Chitty.

Hab. Yallahs Hill.

Form, subdiscoidal. *Colour*, very pale horn or pure white. *Sculpture*, about 30 or 40 spiral carinæ, almost obsolete, scarcely visible under a $1\frac{1}{4}$-inch microscope, about 5 being rather more sharp than the rest; on the upper whorls about 7. *Spire*, very slightly elevated, with rather concave outlines. *Whorls*, $3\frac{1}{3}$, moderately rounded, with a slight suture; last whorl rather flattened at the periphery. *Aperture*, semielliptical, very much produced from the body-whorl, rather depressed above, but elegantly expanded throughout. *Labrum*, very much produced above, joining the body-whorl in a very graceful serpentine curving lamella (by which the shell may be distinguished), much thickened and reflected. *Labium*, mo-

derately detached from the body-whorl and thickened and reflected, slightly curved to the right below, very much below the plane of the labrum. *Umbilicus*, broad and moderately deep. *Labral lamella*, very sharp and narrowly produced. *Operculum*, deeply concave, apparently smooth, or with blunt vertical lamellæ, margined all round, labial side much curved, rather pointed at upper and lower extremity.

Height 0·033, greatest breadth 0·062, least breadth 0·052.

Named in compliment to my friend Dr. Baird, of the British Museum.

Var. *minor*. A much smaller variety, coming from the same habitat.

Blandia MacGillivrayana, Chitty.

Hab. (?) Pedro district, St. Ann's.

Form, subdiscoidal. *Colour*, pale yellow. *Sculpture*, 20 faint, equidistant, spiral carinæ; on the upper whorls, 6. *Spire*, very little elevated, with convex outlines. *Whorls*, 3¼, moderately rounded, with a moderate suture. *Aperture*, large, very broadly expanding, slightly depressed above. *Labrum*, double throughout, but more so above, slightly reflected, white, smooth, much produced above, leaving the body-whorl at an angle of about 50°. *Labium*, almost appressed to the body-whorl in its centre, slightly curved above, more below to the right, below the plane of the labrum. *Umbilicus*, shallow and spreading. *Labral lamella*, very little produced. *Operculum*, not concave, but moderately sunk or depressed (flat or smooth) in its interior surface, more so at the lower labial side; edge on labral side much and broadly folded over convexly.

Height 0·034, greatest breadth 0·055, least breadth 0·045.

Named in compliment to John MacGillivray, Esq., the well-known and able naturalist and collector.

Blandia Troscheliana, Chitty.

Hab. Clarendon Mountains.

Form, subdiscoidal. *Colour*, ——? (only two bad specimens). *Sculpture*, 23 irregular, inequidistant, coarsely rounded, spiral carinæ obsolete at the periphery, 4 more prominent than the rest; on the upper whorls, 5. *Spire*, much depressed, with convex outlines. *Whorls*, 3½, well rounded, with a well-impressed suture. *Aperture*, very slightly expanded, rather flattened above and depressed below, more than a semicircle. *Labrum*, moderately produced above, double, white, thickened and reflected, very slightly pectinated by the four stronger carinæ, or rather squared as in *Wilkinsonœa Moussoniana*. *Labium*, well-detached from body-whorl, slightly curved to the right above and below, on a plane with the labrum below, lower above. *Umbilicus*, broad and deep. *Labral lamella*, very little produced. *Operculum*, smooth and concave, deep on the labial side.

Height 0·03, greatest breadth 0·059, least breadth 0·045.

Named in compliment to Dr. Troschel, of Bonn, Editor of the 'Archiv' of Natural History, &c.

Blandia Hilliana, Chitty.

Hab. ——?, Westmoreland.

Form, subdiscoidal. *Colour*, pale horn. *Sculpture*, 22 inequidistant spiral carinæ, wider apart and stronger above, and a few at the periphery most raised; on the upper whorls, 5. *Spire*, much depressed, slightly concave. *Whorls*, $3\frac{1}{2}$, moderately rounded, with a rather deep suture. *Aperture*, very slightly constricted at the fauces, slightly expanded, depressed above, more than a semicircle. *Labrum*, well produced above and pointedly, leaving the body-whorl at about an angle of 30°, white, slightly pectinated by about five points, thin, reflected. *Labium*, slightly curved below, well detached from body-whorl. *Umbilicus*, rather deep and broad. *Labral lamella* and *operculum*, like *Wilkinsonæa Bensoniana*.

Height 0·025, greatest breadth 0·047, least breadth 0·041.

Named in compliment to the Hon. Richard Hill, of Spanish Town, Jamaica, well known as an ornithologist and lover of general natural history.

Blandia Trailliana, Chitty.

Hab. Clarendon Mountains (unique).

Form, subdiscoidal. *Colour*, pale horn. *Sculpture*, 5 coarser spiral carinæ and 2 coarse; 6th to 10th coarse, with one coarse between, and after, each; 11th coarser, and 5 coarse round umbilicus; on the upper whorls, 5. *Spire*, much depressed, with convex outlines. *Whorls*, $3\frac{1}{3}$, well rounded, with a deep suture; last whorl well-rounded, large. *Aperture*, semicircular, slightly constricted at a distance from the labrum, and then elegantly and slightly expanded. *Labrum*, well produced above, and in an elegant curve, treble above and double below, as in *Helix Rupis-fontis* in my cabinet (N.B. since first describing this shell it has unfortunately got broken), very slightly thickened at its extreme edge, and white. *Labium*, moderately detached from body-whorl, wide and much reflected, curving slightly throughout, below the plane of labrum. *Umbilicus*, moderately deep and broad. *Labral lamella*, slightly produced. *Operculum*, ——?

Height 0·034, greatest breadth 0·057, least breadth 0·041.

Named in compliment to Dr. Traill (Malacca?), the great East Indian collector.

Blandia Lukisiana, Chitty.

Hab. Near Port Maria (unique).

Form, subdiscoidal. *Colour*, pale horn. *Sculpture*, 27 fine sharp spiral carinæ, the 6th, 10th, 15th and 23rd being rather stronger; on the upper whorls, 6. *Spire*, much depressed, with slightly convex outlines. *Whorls*, $3\frac{1}{3}$, moderately rounded, with a moderate suture. *Aperture*, slightly depressed above, expanded below, semielliptic. *Labrum*, produced above in a curve, leaving the body-whorl

in a quasi angle of about 80°, double and widely so above, pectinated by about 5 points, very slightly reflected, white. *Labium*, nearly straight, very little curved to the right below, slightly detached from the body-whorl, on a plane with the labrum above, lower below. *Umbilicus*, moderately deep. *Labral lamella*, rather produced in its centre. *Operculum*, —— ?

Height 0·024, greatest breadth 0·051, least breadth 0·04.

Named in compliment to Dr. Lukis of Guernsey, an able naturalist and antiquary.

Blandia Loweana, Chitty.

Hab. Bodle's Pen Wood, St. Dorothy.

Form, subdiscoidal. *Colour*, dark horn. *Sculpture*, spiral carinæ, 5 less and 1 strong repeated four times, then 5 less and 2 strong, then 3 fine and 1 strong, and 4 less strong; on the upper whorls, 7 or 8. *Spire*, very slightly elevated, with slightly concave outlines. *Apex*, obtusely prominent. *Whorls*, $3\frac{1}{2}$, very slightly rounded, with a deep suture. *Aperture*, more than a semicircle, rather expanded above, very slightly deflected and expanded below. *Labrum*, slightly produced above at the 1st and 2nd strong carinæ, broadly pectinated and scolloped by all the strong carinæ. *Labium*, well detached from the body-whorl, below the plane of the labrum above, slightly rounded and nearly up to the plane of the labrum in the lower end. *Umbilicus*, moderately deep. *Labral lamella*, very sharp and narrow. *Operculum*, deeply concave in the centre and minutely granulated; two or three microscopic lamellæ crossing vertically, the edge all round thickened and deeply reflected outward, the upper edge having five or six deep irregular vertical folds.

Height 0·027, greatest breadth 0·055, least breadth 0·042.

Named in compliment to the Rev. R. T. Lowe, lately Chaplain in Madeira, and the well-known contributor to the natural history of that island.

November 10, 1857.—Dr. Gray, F.R.S., V.P., in the Chair.

Notes on an unnamed Parrot from the Island of St. Domingo; and on some other Species of the same Family. By Philip Lutley Sclater, M.A.

M. Auguste Sallé has called my attention to the fact, that the White-fronted Parrot of San Domingo, commonly regarded as the immature state of *Chrysotis leucocephala*, is in truth quite a different species from that bird. It may be distinguished at once by having no red on the throat and a narrower white frontal band than the true *leucocephala*, which is from Cuba. M. Sallé, who has had ample opportunities of observing this bird in its natural state, is confident as to its distinctness, and I have no doubt he is quite right. Under these circumstances, I propose to call the San Domingan bird, which has not yet received a specific designation, *Chrysotis Sallæi*,—a just ribute to one who has made such extensive discoveries in the

natural history of the New World, and is the only modern naturalist who has explored the still imperfectly-known zoology of the island which it inhabits.

The true *Chrysotis leucocephala* is figured in Edwards's 'Gleanings,' vol. iv. pl. 166, as "*The White-fronted Parrot*," and by Buffon in the 'Planches Enluminées' as the "*Perroquet à front blanc du Sénégal*," and "*Perroquet de la Martinique*," nos. 335 and 549. It is also well represented by Le Vaillant as the male of "*Le Perroquet à face rouge*" (pl. 107 et 107 bis). It is included in the revised list of Cuban birds lately published in Cabanis' Journal; and specimens in the collection of the Academy of Philadelphia were procured by Mr. Richard Taylor in that island.

Examples of this bird likewise occur in the British Museum, and there is a specimen now living in the Society's gardens.

The *Chrysotis Sallæi* is figured by Buffon in his 'Planches Enluminées,' no. 548, as the "*Perroquet à ventre pourpre de la Martinique*." Specimens collected by M. Sallé in San Domingo are in the British Museum and at the Jardin des Plantes at Paris, and there are two fine examples now living in the Society's gardens.

There is likewise living in the Society's gardens an example of another nearly allied species of Parrot, which has also been sometimes confounded with the true *Chrysotis leucocephala*. This is the Red-fronted Parrot (*Chrysotis vittata*), figured in the 'Planches Enluminées' under the title of "*Perroquet de S. Domingue*," and often called by Gmelin's specific name "*dominicensis*." It is not, however, as far as I know, found in the island of Dominica, but in Puerto Rico, whence examples, now in the Museum of the Jardin des Plantes at Paris, were transmitted by Maugé. Le Vaillant has represented this bird as the female of his "*Perroquet à face rouge*."

Mr. Gosse's *Psittacus leucocephalus* from Jamaica, of which there is one specimen in the British Museum, seems different again, and ought probably to bear the name *Chrysotis vinaceicollis*; the bird described by M. de Lafresnaye as *Pionus vinaceicollis* (Rev. Zool. 1846, p. 321) being probably intended for the young of this; but a larger series of examples is perhaps requisite to confirm this species.

It is very interesting to notice how the different islands of the Antilles are thus tenanted by distinct, though corresponding, species of Parrots:—Cuba by *Chrysotis leucocephala* and *Conurus guianensis** (?), Jamaica by *Chrysotis vinaceicollis* and *Conurus nanus*, Puerto Rico by *Chrysotis vittata* and *Conurus Maugæi*†, and San Domingo by *Chrysotis Sallæi* and *Conurus chloropterus*‡.

While upon the subject of Parrots, I may add some notes taken during a late inspection of specimens of these birds in several museums.

Prince Bonaparte, in one of his last papers, proposed to call the

* Probably not the true *guianensis* of Guiana, but so called by Cabanis, Journ. f. Orn. 1856, p. 106.

† *Psittacara maugæi*, Souancé, Rev. et Mag. de Zool. 1856, p. 59.

‡ *Psittacara chloroptera*, Souancé, Rev. et Mag. de Zool. 1856, p. 59.

little Mexican Conure, which so nearly resembles *Myiopsitta tigrina* of Souancé, *Bolborhynchus catharina* (Compt. Rend. March 1857). But there is no doubt that the Mexican bird (whether really distinct from the Venezuelan *tigrina* or not) should bear the name *lineola* of Cassin. Mr. Cassin's type, which is in the Philadelphian Academy's Museum, was obtained by Mr. Pease, near Puente Naçional, in the State of Vera Cruz, and there is no ground for supposing error in the locality. I have seen the same bird in the collection of Dr. Cabot of Boston. It was obtained by him in Yucatan, in the island of Cosumel in 1842.

The Parrots belonging to the genus *Tanygnathus* of the East Indian islands are in much confusion, which a more accurate knowledge of the localities whence specimens are brought would, I think, soon clear up. The type of the genus, *Tanygnathus macrorhynchus* (Pl. Enl. 713), distinguished by its enormous blood-red beak and green head, with the wings varied with black and yellow, is said to be from New Guinea. This is very likely to be the case, but more certain localities are the islands of Gilolo, where examples were procured by Forsten, and Ceram, where Reinwardt found it living, as I learn from the marked specimens in the Leyden Museum. Next to it comes *T. marginatus* (Pl. Enl. 287, *fig. mala*) from the Philippines. This species has the hind part of the head blue, and the wings varied with yellow and blue. A third bird of this genus is *Tanygnathus Mulleri*, Bp. Consp. p. 5, et Müll. et Schlegel, Verh. Ned. Ov. Bez., Land en Volk. p. 108. The type-specimen of this bird (which is in the Leyden Museum) was brought by Müller from the island of Bouton; but the same species occurs near Macassar, in the adjacent island of Celebes, whence Mr. Wallace has lately transmitted specimens; and living examples in the Zoological Gardens at Rotterdam are said to be from Timor.

We have now living in the Society's gardens examples of *Tanygnathus macrorhynchus* and *T. Mulleri*.

In our gardens we have also now living another very interesting bird, namely the large green Lory, described by Prince Bonaparte in a note in our 'Proceedings' in 1850 (p. 26) as *Psittacodis Westermanni*, which may be easily distinguished from its near ally, the *Psittacus magnus* or *sinensis* of the older authors (of which we have also a living specimen), by the want of the red patch on the flanks, as well as by the different hue of the deep green colour. Prince Bonaparte has employed for these birds, which, as he well remarks, form the only *green* genus of true Lories, the term *Psittacodis*. But the true type of *Psittacodis* (as constituted by Wagler*, its originator) is the extraordinary Parrot, *Psittacus paragua*—a distinct form altogether, to which Prince Bonaparte has applied the name *Stavorinius*. Mr. G. R. Gray, in his last List of Genera (p. 88, genus 1491), applies the term *Mascarinus* to these Parrots. But Lesson's name *Mascarinus* cannot, I think, possibly be used otherwise than for the *Psittacus mascarinus* of Madagascar, which Lesson placed within the genus, although he did not arrange it as the first

* Wagler, Mon. Psittacorum, p. 495.

species. It seems quite absurd to call a group of birds occurring only in the Moluccas "*Mascarinus.*" I therefore suggest the adoption of the term "*Polychlorus,*" given by Scopoli as the specific designation of *Psittacus magnus*, as a generic name for these birds—which will so stand as *Polychlorus magnus*, and *Polychlorus Westermanni*; and the third species, Prince Bonaparte's *Psittacodis intermedius*, of which there are examples in the British and Leyden Museums—as *Polychlorus intermedius*.

It is singular that the only other known example of *Polychlorus Westermanni*, from which Prince Bonaparte's description was taken, is also a living bird in the Zoological Gardens of Amsterdam, where the collection of *Psittacidæ* (which I had the pleasure of inspecting a few weeks since) is very good, embracing about sixty-four species.

It is however surpassed by that in our own Gardens, where at the present moment no less than seventy-five species may be seen living.

On Siphonognathus, a new Genus of Fistularidæ. By Sir John Richardson, F.R.S., Hon. F.R.S.E. etc.

Siphonognathus, gen. nov.

Facies elongata, fistulosa, Aulostomatum, *ex osse nasali et frontali, ossibusque palatinis, preoperculis, pterygoideis cum tympanicis productis formata. Præmaxillaria sub lateribus ossis nasalis, fere immobilia. Rictus oris mediocris, horizontalis in rostro extremo, motu solo cardinali mandibulæ subincurvæ aperiens et claudens. Maxillæ pars descendens, gracilis in disco parvulo subrotundo ad angulum oris expansa. Labia præmaxillaria et mandibularia arcta, super ossa propria replicata: priora ex utroque latere ante os nasali approximantia coalescentiaque et filamentum parvulum, impar, terminale, gracile præ ore instar proboscidis dependens, efficientia.*

Foramina narium utrinque bina in acie faciei ad oculum approximata: apertura anterior, operculata, vix oculo nudo discernenda, posteriori hianti nec marginatæ vicina. Dentes omnino nulli. Pharynx angusta, lævis. Cranium nec cristatum nec spinosum. Apertura branchialis obliqua, infra antrorsum tendens. Ossa branchiostega quatuor utrinque, gracilia. Branchiæ quatuor. Vertebræ costiferæ 29–30 *circiter. Costæ breves, graciles.* (*Vertebræ caudales non numeratæ.*) *Anus pone medium.*

Squamæ cycloidei læves, ovales, in tempora, genas et occiput procurrentes; vultus esquamosus, lævis. Forma corporis elongata, subcylindrica; caudæ pyramidata.

Pinnæ ventrales nullæ. Pinna caudæ cordato-lanceolata, acuminata. Pinnæ pectoris radiis paucis apicibus simplicibus, planis non dilatatis. Radii anteriores pinnæ dorsi, elastici, non pungentes, nec tamen articulos ostendentes. Pinnæ ani radius primus eodem modo subspinosus. Radii omnes pinnarum simplices membrana tenui connexi.

Intestina simplex, sine versura rectè in anum tendens; dilatatio ventriculi parva. Cæca pylorica nulla nobis detecta. Vesica pneumatica ampla.

SIPHONOGNATHUS ARGYROPHANES.

In general form this fish approaches *Aulostoma*, the structure of the head and the tubular elongation of the palate and os hyoides being similar. The body is less compressed, being roundish, but yet with somewhat flattened sides, and a slight tapering towards the anus. The compression increases in the tapering tail. As in *Aulostoma*, the great length of head is due to the prolongations of the prefrontals, palatines, vomer, nasal, pterygoids, tympanics and hyoid bones, constituting a tube terminated by the horizontal opening of the mouth. The premaxillaries form the upper border of the mouth, and have little or no motion. They conceal the slender limb of the maxillary, but the irregularly triangular or small suborbicular plate of the latter protects the corner of the mouth. Equal in length to the maxillaries, the mandible is articulated to the extremities of the tympanics, and is slightly curved, producing a lateral gaping when the mouth is closed. Both it and the premaxillaries are edged by narrow lips which fold back on the limbs of their respective bones. At the extremity of the snout the premaxillary lips unite to form a fine awl-shaped proboscis-like barbel, which hangs down before the mouth. No teeth whatever could be discovered in the jaws or in the tubular mouth,—not even in the pharynx, which is narrow. Form of the head a slender four-sided obelisk, the space between tbe eyes being occupied by the forked mid-frontal, into which the nasal is dovetailed. The latter as it runs forwards is feebly convex, and shows a smooth and scarcely prominent medial line, which terminates in the slightly swelling extremity of the bone and of the snout. Under each edge of the nasal, the long slender premaxillary appears as already mentioned. On the sides, the facial tube is completed by dark brown membrane, and on the ventral surface also a membrane stretches from the interopercula and tympanics of one side to those of the other, being supported on the mesial line, interiorly by a very slender lingual bone, which is neither prominent nor covered with flesh so as to form a tongue. Continuous with this under-surface of the mouth follows the branchiostegous membrane, whose deeply crescentic distal edge makes no flap at the isthmus to which it is attached. Four slender, moderately long, elastic branchiostegals support the membrane on each side. One specimen, it may be noticed, has only three branchiostegals on the right side. The gill-plate is connected to the nuchal region by scaly membrane, and terminates in a small flexible strap-shaped apex, above which only a small corner of the gill-opening appears, nine-tenths of the opening being below it. No bony crests or spinous points exist on the cranium. The nostrils are on the edge of the head, close before the eye, the hinder one being an open pore, not above a line from the orbit, and the other is situated a quarter of an inch before it in a pulpy membrane, and being closed

by a flap is not very perceptible. The space between each pair is of course equal to the breadth of the head in that region.

Scales cycloid, oval, most of them oblique, or unequal at the base, of moderate size and delicate texture, showing very fine concentric lines of structure, and from five to fifteen faint basal grooves. Scaly integument covers the upper half of the operculum, and also a rectangular space bounded anteriorly by the vertical limb of the preoperculum and the eye. On the top of the head the scales end by a crescentic line, whose ends touch the angles at the eye. The facial part of the head is clothed with scaleless integument, and there are many pores and mucous canals extending along the under edge of the prefrontal. A soft tubular ring supplies the place of suborbital bones, and the small preorbitar scale bone is almost membranous, but becomes rough in drying, from the number of mucous canals which run through it. Between the gill opening and the caudal fin, there are 102 scales in a longitudinal row, six rows above the lateral line, and nine below it. The lateral line is formed by a row of small pores, each placed on the tip of a small scale, of whose disk little appears, because of the overlapping of the adjoining scales above and below. A taper-pointed scale terminates the scaly integument on the base of the caudal on each side.

Fin-rays.—Br. 4—4 ; D. 23|23, last two approximated at the base ; A, 2|13, last two approximated at the base ; C. 17 ; P. 10 ; V. 0. Dorsal commencing over the bones of the pectorals and just behind the tips of the gill-covers. It runs considerably past the anus, and some way further than the anal, its outline being even, though rising slightly in its course. Its rays are simple and unbranched like those of the other fins (except the caudal), and half of them are without visible joints, elastic at the base and tapering with flexible points. The anal commencing near the anus does not reach so far down the tail as the dorsal. It is composed of similar rays, and in the anterior two the joints are obsolete. The caudal, semilanceolate at the base, tapers to a slender, very acute point. Its rays are sparingly divided at the tips. Pectorals supported by ten simple rays with flattened but not dilated tips. No ventrals.

The intestines of the smaller specimen were examined, but not satisfactorily, as they had received injury, particularly the air-bladder, from a glass rod that had been thrust down the throat of the fish. The alimentary canal is quite straight and simple, with a slight widening below the œsophagus, but no defined stomach. No pyloric cæca were detected. The inside of the gut was thickly lined by a fine, flocculent mucus-like matter, and on scraping it away a multitude of longitudinal striæ were seen extending along the inner membrane. The liver, partly perished, was on the right side, and did not descend far. Air-bladder torn, so that its size and form could not be ascertained. It appeared to have been large, and its coats to have been soft, fibrous, and nacry, and though thick, very readily torn. The melt was enclosed in a delicate capsule with a long seminal duct.

Under the lateral line there is a bright silvery stripe extending the

whole length of the fish, and above it a stripe of equal breadth of a brownish-purple colour. This stripe reaches the tip of the caudal in one direction, and in the other passes over the upper part of the gill-cover, along the sides of the head to the mouth. Above, the back is of a lighter brown, and along the base of the caudal there is a purplish-black line. These colours are described as they exist after two or three years of maceration in spirits, and they have doubtless undergone alteration since the fish was taken.

Science is indebted for this novel and highly interesting form of fish to the late Captain Sir Everard Home, who never lost an opportunity of adding to our natural-history collections. He obtained it in King George's Sound. Some half-digested pieces of fish were found in the mouth, but nothing except mucus in the intestines.

Dimensions.

	Inches.
Length from tip of the snout to extremity of caudal, exclusive of rostral barbel	16·50
——— from tip of the snout to tip of the gill-cover	4·80
——— from tip of the snout to fore-edge of the orbit	3·00
——— from tip of the snout to anus	10·00
Distance between the orbits	0·38
Length of diameter of the eye	0·45
——— of rostral barbel	0·62
——— from posterior angle of the eye to the tip of the gill-cover	1·43
——— of the opening of the mouth	1·10
Height of the head behind the preoperculum	0·65
Greatest breadth of shoulders or nape	0·70
Height of body behind the pectorals	1·00
Length of naked space between dorsal and caudal	2·00
——— of caudal fin	2·50
——— of attachment of anal fin	1·80
——— of pectorals	0·95
Height of posterior dorsal rays	0·80

November 24, 1857.—J. Gould, Esq., F.R.S., V.P., in the Chair.

On Four New Species of Mus and one of Hapalotis from Australia. By John Gould, F.R.S., V.P., etc.

Mr. Gould alluded to the prevailing opinion that none but Marsupial animals were to be found in Australia, and observed that this opinion may be correct to a certain extent, yet the *Placentalia* are well represented in that country by numerous species of the genera *Hapalotis*, *Mus*, &c.; and remarked that in few countries are the smaller members of the *Rodentia* more abundant both in species and individuals. It is to this latter order that the four new species now exhibited by him pertain.

For the first of these he proposed the name of *Mus assimilis*; this animal is about the same size as the *Mus decumanus* of Europe, and

has a very similar aspect; its hair, however, is more soft and silky, and its incisor teeth very long and narrow.

MUS ASSIMILIS.

Face, all the upper surface and sides light brown, very finely pencilled with black; under surface greyish-buff, the base of the fur all over the body dark slaty-grey; whiskers black; tail nearly destitute of hairs; all the feet clothed with very fine silvery-white hairs.

Total length from nose to base of tail....	$7\frac{1}{4}$	inches.
———— of the tail	6	,,
———— of fore-arm	1	,,
———— of the tarsus and toes.....	$1\frac{1}{4}$	,,

Remark.—The minute silvery-white hairs of the feet give these organs a very delicate appearance; yet they are not positively white, neither are they brown.

The two specimens from which the above description was taken and to which the remarks refer are from the banks of the Clarence in New South Wales, where they were procured by the late Mr. Strange. Three other specimens collected by Mr. Gilbert at King George's Sound differ only in being about a fifth smaller in all their admeasurements; it is just possible that it will hereafter be found that these latter animals are distinct from the former, but at present they are regarded as identical; and if such be the case, the range of the species extends along the whole southern sea-board of the continent from east to west.

The second species is a short, robust, compact Rat, equal in size to the common Water Vole of England (*Arvicola amphibius*), but rather smaller than the *Mus fuscipes* of Australia. It is in every respect a true *Mus*, and is an inhabitant of the open plains of Darling Downs, New South Wales; its incisor teeth, when compared with those of *M. assimilis*, are broad and less elongated; its hair also is coarser and more wiry. Its colouring is as follows:—

MUS SORDIDUS.

Head, all the upper surface and flanks clothed with a mixture ot black and brown, the former hue prevailing along the centre of the back, and both nearly equal in amount on the flanks; whiskers black; under surface greyish-buff; hind feet silvery-grey; fore feet greyish-brown; tail thinly clothed with extremely fine black hairs.

Total length from nose to base of tail....	$6\frac{3}{4}$	inches.
———— of the tail	5	,,
———— of the fore-arm	$\frac{3}{4}$	,,
———— of the hind-leg and toes....	$1\frac{1}{2}$	,,

Hab. Open plains of Darling Downs.

Remark.—The name of *sordidus* has been assigned to this animal from the dark colouring of its upper surface.

The third species to which Mr. Gould called attention is a remarkable black Rat, of nearly the same size as, and of a similarly delicate

form to, the Black Rat of Europe (*Mus Rattus*), from which it differs however in having the tip of the nose, the front part of the lips, a longitudinal stripe on the breast, the hind and fore feet, white. For this he proposed the name of

Mus manicatus.

Head, ears, and all the upper surface black, gradually passing into the deep grey of the under surface; nose, fore part of the lips, stripe down the centre of the throat and chest, hind and fore feet, white; whiskers deep black; tail denuded of hairs.

Length from nose to base of tail	7	inches.
——— of the tail	5	,,
——— of the fore-arm	$1\frac{1}{2}$	,,
——— of tarsi and toes	$1\frac{3}{8}$	,,

Hab. Port Essington.

Remark.—This animal was presented to Mr. Gould by J. B. Turner, Esq.

The fourth is a very diminutive Rat, with coarse hair and a somewhat short tail; it is even smaller in size than the *Mus Gouldi* and *M. gracilicauda*, but is more nearly allied to the latter than to any other. Three or four specimens, all of the same size, are contained in the collection at the British Museum, and there are others in the Derby Museum at Liverpool, all of which were collected by Mr. Gilbert on the Victoria Plains, Western Australia.

Mus nanus.

Head, all the upper surface, flanks, outer sides of the limbs, and hairs clothing the tail, brown, with numerous interspersed fine black hairs; under surface greyish-white, becoming much lighter and forming a conspicuous patch immediately beneath the tail; whiskers black; feet light brown; base of the whole of the fur bluish-grey.

Length from nose to base of tail	4	inches.
——— of the tail	$3\frac{1}{4}$	,,
——— of the fore-arm	$\frac{1}{2}$	,,
——— of the tarsus and toes	$\frac{3}{4}$	,,

This animal is known to the Aborigines of Moore's River in Western Australia by the name of *Jilbeetch*.

On the part of Dr. Gray, Mr. Gould brought under the notice of the Meeting a new and very distinct species of *Hapalotis*, which is nearly allied to, but considerably exceeds in size, the *Hapalotis melanura*. This animal was collected by Mr. Elsey in the interior of Australia during the recent expedition from the north-west coast of Australia to Moreton Bay. It is a harsh wiry-furred animal, and differs from *H. melanura* not only in size, but in the apical half of the tail being white.

Hapalotis hemileucura.

Head, all the upper surface and flanks very light sandy-brown,

with numerous, but thinly placed, fine long black hairs; under surface buffy-white, with even lighter feet and fore-arms; tail brown, deepening into black about the middle, beyond which the apical portion is white; the white hairs being prolonged into a small tuft at the tip.

Length from nose to base of tail	8 inches.
——— of the tail.....	$6\frac{1}{2}$,,
——— of the fore-arm.....	$1\frac{1}{2}$,,
——— of the tarsus and toes	$1\frac{1}{2}$,,

GEOLOGICAL SOCIETY.

December 16, 1857.—L. Horner, Esq., V.P.G.S., in the Chair.

"On a remarkable Fossil Specimen belonging to the Genus *Neuropteris*, from the Coal-measures of Lancashire, and Remarks on that Genus." By C. J. F. Bunbury, Esq., F.R.S., F.G.S.

The author begins by noticing the comparative rarity, in a fossil state, of the young half-expanded fronds of Ferns, showing the characteristic *circinate vernation*; and he remarks that the specimens in that state, hitherto figured, belong to the genus *Pecopteris*. He then describes a well-characterized specimen of *Neuropteris* in this circinate condition; it appears to belong to *N. gigantea*, or a variety of it, and was procured from Oldham in Lancashire. This specimen affords a strong confirmation of the opinion, that the fossil Neuropterides were really Ferns, which some have been tempted to doubt, in the absence of any knowledge of their fructification. This specimen shows that they had the characteristic vernation of Ferns; in particular, it shows a striking agreement in structure with the young fronds of *Aspidium exaltatum*. It is thus clear, at any rate, that *Neuropteris* did not belong to the Coniferous Order, in which there never is any approach to the circinate vernation: even in *Salisburia*, the leaves of which have, in their form and veining, so much the appearance of a Fern, their arrangement in the young state is quite different. The only flowering plants which can be compared with Ferns in this respect are the Cycadeæ; and in the absence of fructification it is not easy to prove positively that *Neuropteris* may not have belonged to that family. It is most probable, however, from the composition of the frond, the veining, texture, and all the characters together, that these fossil plants were true Ferns. To determine their nearest affinities in that family is hardly in our power, as there seems to be no constant relation between the vernation or other external characters and the fructification.

The genus *Neuropteris* is chiefly characteristic of the Coal-measures. The author has scarcely seen a genuine species of it from any formation later than the Trias, unless we except the enigmatical Anthracitic beds of the Alps, which afford several species apparently identical with those of the Coal. The Oolitic species referred to this genus by Lindley and Hutton do not agree with its characters. Two